PERUVIAN TREPANNING.

By H. C. HOVEY.

TREPANNING has been practiced in Europe since the age of Pericles. The word, *τρύπᾰνον*, meaning literally an auger, was first used to describe a surgical instrument by Hippocrates. For centuries the tools and methods were rude and imperfect. With the introduction of modern appliances and improved methods the word trephining was employed as a substitute for the original term, trepanning; and the most accurate authorities recognize this distinction, using the latter for the primitive and the former for the perfected process. Thus one of the most eminent surgeons of New York City used to boast that he had successfully "trepanned" a patient with an ordinary mallet and chisel, because the emergency was such that he did not have time to send for his costly "trephine."

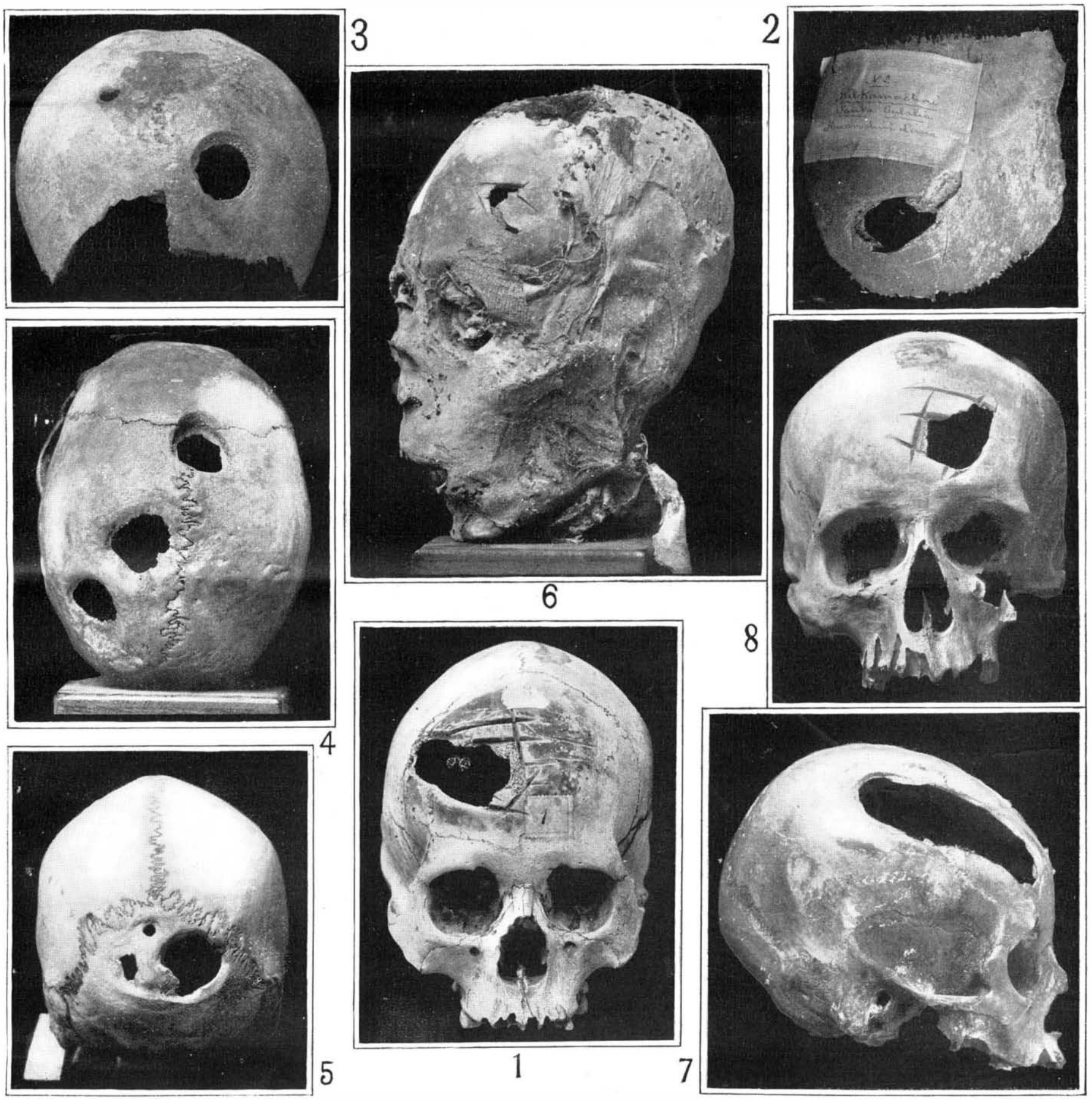
The American aborigines had some familiarity with the mysteries of surgery, as well as of medicine; and their modes of warfare would naturally lead them to seek ways of relieving the dangerous pressure on the brain following blows from spiked war-clubs and other crushing weapons. Their belief in demoniacal possessions would also induce them to seek for devices for liberating the evil spirits from the heads of the possessed. Epilepsy and paralysis were generally attributed by them to demons. Trepanning would thus be suggested to their wise men. In the Rust collection, now in the museum of Beloit College, is a Mexican terra cotta mask or image representing a paralytic whose features were drawn to one side, while the skull was trepanned on the opposite side as a means of relief. This specimen was undoubtedly antique. Others may have been found on our northern continent, although this happens to be the only one the writer has seen.

The ancient Peruvians, however, seem to have been adepts in surgery, as in everything else. They excelled in agriculture, mining, milling, weaving, and engineering. Their cyclopean ruins are marvels of architectural skill. Indeed, they surpassed, in many respects, their Spanish conquerors. Hence we are not surprised to be told that they included a knowledge of the art of trepanning among their accomplishments. Several single specimens have been sent from time to time to American and European museums.

The Muniz collection, exhibited at the World's Congress of Anthropology, and now in the custody of the Bureau of American Ethnology, is the most remarkable of its kind. The entire collection includes about one thousand skulls exhumed from the vicinity of Cuzco, Huarochiri, Tarma, Pachacamac and Canete. They belong to Senor Manuel Antonio Muniz, M.D., Surgeon-General of the Peruvian army, and will shortly be returned to the Peruvian museum at Lima. Nineteen of these skulls are especially interesting as showing the methods and results of primitive trepanning. I take pleasure in acknowledging my indebtedness to Prof. W. J. McGee, of the Bureau of Ethnology, for the privilege of examining this extraordinary collection, and for the accompanying photographs now first published, as well as for permission to avail myself of his accurate observations as to their indications and lessons.*

What first strikes our attention is the fact that no signs are seen of the use of metallic instruments, which to be counted. If ante mortem, the individual certainly could not have survived such heroic treatment (Fig. 1). The supposition is that, in these cases, the purpose was not surgical, but was merely to obtain a bone button to be worn as a trophy or a charm.

Most of the nineteen trepanned skulls, however, show signs of a surgical or thaumaturgic purpose. There are indications of a subsequent sloughing of the bone, or else of reparative growth, either of which would prove the operation to have been ante mortem. The skull represented in Fig. 4 was thrice trepanned, the subject surviving two operations, but finding the third, which cut through two of the sutures, fatal. In several cases the partial or complete absorption of the plates and spongy substance between them is an evidence of the survival of the patient. In one skull (Fig. 5) the bone was plainly diseased, and suggests the possibility that the orifices were caused by decay, instead of artificially. In others the signs of previous cranial



TREPANNING AS PRACTICED BY THE ANCIENT PERUVIANS.

* See descriptive article by Prof. W. J. McGee, in the Johns Hopkins Hospital Bulletin, No. 37, Jan.--Feb., 1894.

fracture are evident. In the head of a mummy (see Fig. 6) the skull had been fractured by a blow, after which the scalp had been laid open and trepanning begun by three incisions, with the object of removing the broken part, but discontinued on account of the death of the patient.

Prof. McGee regards the remaining specimen I shall notice as being of exceptional interest in several ways (Fig. 7). The aperture is of remarkable size and the skull itself is small and thin. The individual was doubtless young and a female. A depression, not near the trepanning, probably by a blow received long before the operation, may have caused the diseased condition, possibly epilepsy, which demanded treatment. Successive operations to relieve this condition were made, which were united in the very large opening now visible, four inches long by more than one inch wide. This enormous aperture was covered by a silver plate found in the mummy case with the remains. The marks of its seat in the skull are distinctly visible, but the plate itself has not been sent to this country, being still in the possession of Dr. Muniz, who vouches for the facts. There is every indication that the patient long survived the series of operations performed, making this ancient Peruvian case worthy of being mentioned along with the historical record of the Count of Nassau's being trepanned twenty-seven times during King William's wars!

The results of modern trephining, with the improved instruments, are generally anything but encouraging. Promptness is demanded in beginning and great caution in proceeding; hence the opinion prevails that greater success attends private practice than those cases where there is delay in getting the patient to the hospital, and a subsequent expedition arising from the multiplied claims on the surgeon's attention.

According to Gross, trephining is nearly always fatal in the hospitals of Paris and Vienna. The proportion of recoveries in the hospitals of London, Dublin, Edinburgh, and other large cities of Great Britain is officially reported as only one in four cases. A similar report is made by the New York hospitals, where it is said that eleven in forty five recover. This makes it remarkable that, in the Muniz collection, eight out of the nineteen individuals whose skulls were trepanned evidently survived one or more operations. Taken as a whole this unique collection is regarded by the Bureau of Ethnology as "by far the largest and most instructive assemblage of specimens of primitive trepanning thus far brought together, and as of special note in that it demonstrates certain points that have been heretofore obscure." It is not denied that the operations may have been partly thaumaturgic, i. e., for the expulsion of evil spirits; but the indications are that there was also a degree of intelligent surgery adapted to remedy cranial fractures, and also to relieve certain diseases of the brain.

[FROM THE LANCET.]

DR. VIQUERAT'S TREATMENT OF TUBERCULOSIS.

By ARTHUR GAMGEE, M.D. Edin., F.R.S.

THE sensational paragraphs which have appeared in various Continental journals, and which have been copied into the English papers, announcing the startling discovery of a new and certain method of treating phthisis and other tuberculous affections induced me to telegraph on Tuesday, September 19, to Dr. Viquerat, of Moudon, asking him whether he would be at home on the following day, as I wished to see him in reference to his treatment of tuberculosis. Receiving an affirmative reply, I left Lausanne by the 5:30 A. M. train, and shortly after 7 A. M. reached Moudon, a quaint mediæval little town, once the capital of the Canton de Vaud. I was received by Dr Viquerat with the greatest courtesy, and in my interview with him, which lasted until midday, he manifested the greatest readiness to acquaint me with his method, and frankly replied to every question which I put to him.

In the criticisms which I shall feel called upon to make, and the warning which I shall feel compelled to address, I must neither be understood to impugn Dr. Viquerat's good faith and veracity nor to cast a slur upon his scientific capacity and his professional devotion. It will, however, be my duty to draw attention to the weak links in the chain of evidence which Dr. Viquerat adduces, and to show, as I think, conclusively, that his method of treatment is yet in the strictly experimental, or rather tentative, stage, and that the evidence in its support is insufficient to justify the confident anticipations which have been indulged in. Instead of building castles in the air only destined to be dissipated, let the friends of phthisical patients in England await the calm judgment of those able to form a sound opinion when the necessary experimental and clinical evidence shall have been laid before them and the means afforded of adequately controlling Dr. Viquerat's assertions.

The experience of the error into which so great an observer as Koch fell, and the fact (which I am bound to refer to) that Dr. Viquerat's enthusiastic nature has led him, on one occasion at least, to announce a therapeutical discovery which has disappointed all expectations, not only justify but compel caution. Dr. Viquerat may rest assured that neither praise nor gratitude nor honors will be grudged him if he prove successful in his struggle with that disease which surpasses all others in the victims which it claims; on the other hand, in the interests of humanity, the leaders of scientific medicine have a right to claim that they shall be allowed to examine the minutest details of alleged medical discoveries before these are submitted to the popular suffrage.

The statements in this article which relate to the details of Dr. Viquerat's method of treatment and to his opinions are derived in part from a pamphlet lately published by him,* in part from a report† dated September 3, 1894, signed with the initials "G. P.," and of which the writer is a young medical man until recently a student in the University of Geneva, but mainly from information directly communicated to me by Dr. Viquerat in my interview of September 20.

* Das Heilverfahren der Tuberculose gegrundet auf bacteriologisch-experimentelle Studien. Von Dr. Viquerat in Moudon. Erste Auflage. Moudon Buchdruckerei. J. Kretz-Bettemann. 1894.

† Rapport sur les Resultats obtenus par M. le Dr. A. Viquerat dans son Traitement de la Tuberculose (Geneve, le 3 Sept., 1894). Imp. Romet, Boulevard de Plainpalais, 26.

Dr. Viquerat's method for the treatment of tuberculous diseases is based upon and suggested by principles and general methods which we owe in part to the great Pasteur and in part to two distinguished pupils of Koch, Behring and Kitasato. Pasteur had shown that animals could be rendered immune from the attacks of certain virulent infective diseases, such as chicken cholera and anthrax, by inoculating them with successively increasing doses of attenuated cultures of the bacteria which occasion them. It was afterward found that protective immunity could likewise be secured by injecting cultures sterilized by heat or cultures which had been freed from all bacteria by filtration through unglazed earthenware. Such sterilized or filtered cultures owe their immunizing properties to soluble chemical substances which are produced by the pathogenic bacteria, and which, when introduced in sufficiently large quantities into the animal organism, induce all the phenomena of the special bacterial disease. Thus immunity against tetanus or against diphtheria can be induced by repeated subcutaneous injections of gradually increasing quantities of the soluble toxic substances which are formed by the tetanus and diphtheria bacilli respectively. It is, however, to Behring and Kitasato that we owe the conception and the actual method for the treatment of bacterial diseases by means of the serum of immune animals, and it is they who may be said to have introduced "serum therapeutics." They showed in 1890 that when the blood serum of rabbits which had been rendered immune from tetanus was repeatedly injected subcutaneously into mice, these creatures, which are peculiarly susceptible to the tetanus poison, were in their turn rendered immune, so as to be ultimately unaffected by the injection of the most virulent cultures of the tetanus bacillus or the strongest solution of its poisonous products.

They found, moreover, that the serum of an immunized animal when mixed, outside the body, with a virulent culture or a toxic solution of its soluble products destroyed their power of inducing the phenomena of tetanus. Further, they discovered that the serum of animals rendered immune from tetanus when repeatedly introduced into the body of others already suffering from the disease caused the symptoms to abate and often led to recovery. These beautiful and wonderful discoveries led, in the first instance, to a rational method of treating tetanus as affecting man which in the hands of Tizzoni, Javel and others, has enabled them to save many lives which would otherwise have certainly been sacrificed.

The same method applied by Behring to diphtheria has led to the treatment of this disease by the serum of horses rendered immune from diphtheria—the treatment which, as carried out by Dr. Roux, the distinguished chef de service of the Pasteur Institute in Paris, has reduced the mortality from 63 per cent. of all treated (the proportion of deaths in the cases occurring in a hospital when the old treatment was at the same time being carried out) to 26 per cent., and, as carried out in Berlin, has reduced the mortality from 41 to 15 per cent. of all cases treated (Aronson). If one considers that a large number of the 300 cases treated in Paris and the 274 cases treated in Berlin were in the last stages of the disease, and that in many the gravest complications existed, it cannot be doubted that when the treatment of diphtheria can be undertaken in its early stages the results will be still more remarkable, and that this dreaded disease will, through the beneficent researches of science, have been deprived in great measure of its power of evil.

Inasmuch as pulmonary phthisis and other tuberculous affections are the result of the activity of a pathogenic micro-organism, the tubercle bacillus of Koch, it occurred to Dr. Viquerat to employ in this treatment the serum of animals immune from tubercle, and in the first place to endeavor to find some animal easily available to man which possesses a natural immunity from tubercle. It has been shown how artificial immunity from the inroads of pathogenic bacteria may be secured, and a few words must now be devoted to natural immunity.

There exists a natural immunity, relative or absolute, which explains why certain individuals readily fall a prey to specific bacterial diseases, such as the infective and contagious diseases, while others escape scatheless who are placed under precisely the same conditions. There are instances of natural immunity possessed by certain of the lower animals which are very remarkable. Thus the common rat possesses almost complete natural immunity from anthrax, while the white rat is readily affected by it. In his inquiries Dr. Viquerat discovered that the only domestic animals which under the normal conditions of their existence have never been observed to become tuberculous are the ass and the mule. Even the horse, as the writer learns from a letter received from Dr. Guillebeau, the eminent professor of pathology in the Veterinary School of Berne, is so rarely the subject of tuberculous affections as to have been long held to possess a natural immunity from such diseases; its absolute immunity has in recent times been disproved.

In the articles which have appeared on the subject of the Viquerat treatment the statement is made that it consists in the injection of the serum of asses' blood into the body of the person or animal affected; and in the pamphlet published by Dr. Viquerat, as well as in the report already referred to, allusion is only made to asses' serum without any mention of the animal yielding the serum having been subject to inoculation with tubercle. Dr. Viquerat, however, brought before the writer facts which prove that the immunity enjoyed by the ass is not an absolute one, and informed him that, in order to strengthen the natural immunity, he subjects the ass or mule which is to yield the immunizing serum to inoculation with cultures of the tubercle bacillus.

The ass and the mule, according to Dr. Viquerat, though never becoming subject to tubercle under ordinary conditions and offering a far greater resistance than the horse, do not enjoy an absolute immunity under certain experimental conditions, though he asserts that in the case of these animals the tuberculous affection which is artificially induced invariably terminates in recovery. The natural immunity of the animal, he asserts, is re-enforced by the temporary disease, so that its blood serum introduced into the body of other animals possesses the power of arresting the progress of tuberculous affections and (if these are uncomplicated) of curing them. The actual process employed by Dr. Viquerat in order to prepare the ass or mule which is to yield the serum for the treatment of tuberculous affections is as follows: 30 c. c. of an active bouillon culture of the tubercle bacillus are injected subcutaneously, and, immediately before or afterward, 15 c. c. of the same culture are injected into the blood stream through one of the jugular veins. He asserts that subsequently the ass or mule exhibits no rise in temperature or other symptoms of disease, and that the only objective phenomenon is a remarkably voracious appetite.

As the animal, according to Dr. Viquerat, invariably survives, no evidence of any tuberculous infection following the inoculation would be available had he not killed a series of donkeys at varying periods subsequent to the operation. As a result of these observations, he asserts that if an ass or mule, treated as above described, be killed between the fifteenth and thirtieth day after inoculation, the lungs are found to be pervaded by miliary tubercles which are never surrounded by hyperæmic lung tissue. If the animal be killed between the thirtieth and fortieth day, Dr. Viquerat asserts that the tubercles are found to be disappearing, leaving no trace behind them, while after the fortieth day the lungs are always found to have returned to a condition of perfect health. It is from the forty-fifth day, when spontaneous cure has already been more than completed, that the animal is used to supply the curative serum. With this object it is bled, and the blood is allowed to stand over ice so as to allow it to clot and to permit of the separation of serum. To this serum from 0·5 to 0·75 per cent. of carbolic acid is added, and it is then stored in stoppered bottles until required for use. Without wishing to be hypercritical, I must point out that the above statements are of so remarkable and withal of so improbable a character, that they cannot be accepted until the most complete and detailed record of each experiment is published, and until the results are confirmed by independent observers.

The number of observations would have to be very large in order to establish the fact that the ass or mule is after inoculation into the blood invariably affected by an acute miliary tuberculosis of the lungs—a miliary tuberculosis always terminating in recovery. It may very reasonably be objected that, unless the chances of error were minimized by such a number of experiments as the costliness of the animal experimented upon almost precluded, the probability is that the asses which when killed exhibited pulmonary tuberculosis would in the natural course have succumbed, while those which when killed exhibited no tubercle had probably remained uninfected.

A further criticism which will suggest itself to all who are conversant with experimental bacteriology is that, while Dr. Viquerat has followed up to a certain point the method of Pasteur, of Behring, of Kitasato and others, of inducing immunity against a bacterial disease by inoculation of the bacteria which induce it, his method is altogether exceptional, as he satisfies himself with a single inoculation and furnishes no proof that he has thereby induced absolute artificial immunity. But "enough of these pedantic objections" may be the remark of the enthusiast, only too anxious that Dr. Viquerat's predictions should be immediately accepted. "What are the facts on the strength of which Dr. Viquerat relies?" The first and, as it appears to me, the most promising of all the statements which Dr. Viquerat communicated to me was the following: that when the immunized serum of the ass or mule is injected every second day into guinea pigs which have been fifteen days previously rendered tuberculous by the inoculation of active tubercle cultures, the tuberculous glands which had become enlarged and perceptible rapidly become smaller and disappear, while the animal, instead of dying fourteen or fifteen weeks after the inoculation, regains perfect health.

If the observations made by Dr. Viquerat on this point be accurate, it appears to me that they offer the surest promise that sooner or later tuberculous diseases will yield to the treatment by the serum of animals rendered perfectly immune in respect of tubercle. But it is on the results which he has obtained in the treatment of tuberculous diseases affecting man that Dr. Viquerat in great part relies. Since February he has treated twenty five cases, among which are many diagnosed as cases of pulmonary phthisis in its earlier and later stages, as well as others representing various forms of surgical disease alleged to be of a tuberculous nature, no proof whatever being given of the fact. His usual plan is to inject 12 c. c. of the prepared serum every third day. I saw two patients thus injected, and I can vouch for the fact that in neither of these had the numerous injections to which they had previously been subjected led to any local accident—such, for instance, as suppuration.

All the information which is furnished in regard to the twenty five cases of alleged tuberculous affections treated up to the present time by Dr. Viquerat is contained in the so-called "report," to which allusion has already been made. This "report"* furnishes the most unsatisfactory and disappointing evidence which can be adduced in support of Dr. Viquerat's statements, and the amusing tone of authority assumed by its author is no less remarkable than the looseness of nearly every statement which it contains. Before criticising the list of cases given in this so-called report it must be stated that at the foot of the document is printed the following announcement: "Sur la vue de ce rapport medical un Institut vient d'etre cree a la Cote-Drize a Geneve, dans lequel M. le Dr. Viquerat continue ses travaux de recherche et ou une clinique s'ouvrira le Nov. 1er, 1894. Les tuberculeux seront traites a l'Institut Viquerat dans l'ordre de leur inscription." Seeing the importance which, according to the paragraph just quoted, appears to have been ascribed to this so-called report, it would have seemed reasonable not to conceal the identity of its author, and to have furnished proofs, which are doubtless forthcoming, that he has now ceased to be in statu pupillari, and that his report may therefore be properly termed a medical report.

But to return to the twenty-five cases of supposed tuberculous affections referred to in the report: I must point out that no conclusions whatever can be drawn

* The Lancet, September 29, 1894.